to be returned to vendor

INSTRUCTION MANUAL

Panoramic*

POWER SPECTRAL

DENSITY ANALYZER

MODEL PDA-1

Gertsch*

EMPIRE*

Sensitive Research*

Panoramic*

SINGER

*A Trademark of THE SINGER COMPANY

Precision electrical and electronic instruments for measurement

THE SINGER COMPANY • METRICS DIVISION

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*Commander** Instruments: Potentiometers, Bridges,
Volt Ratio Boxes and Standard Resistors.....5 years
*Sensitive Research** Electrical Indicating Instruments.....2 years
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Repair or replacement (at our option) without charge (F.O.B. factory) will be effected when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, semiconductors, batteries, fuzes, lamps, thermoelements, and *RatioTran** potentiometers are excluded from warranty coverage. Warranty returns must first be authorized by the factory.

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This warranty is in lieu of all other obligations or liabilities expressed or implied and The Singer Company neither assumes, nor authorizes any person to assume for them, any other liability in connection with sales of instruments manufactured by The Singer Company, Metrics Division.

THE SINGER COMPANY • METRICS DIVISION
915 PEMBROKE STREET, BRIDGEPORT, CONNECTICUT • 3211 S. LA CIENEGA BLVD., LOS ANGELES, CALIFORNIA

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Instruments should be returned only on prior written authorization from the Singer Representative or the factory(1). Warranty repair will be made upon written request. Please provide the following information in order to expedite our processing of your instrument:

1. Model or Type
2. Serial Number
3. Description of trouble(2)
4. Test instruments used
5. Approximate date instrument was placed in operation
6. Approximate number of hours of use
7. Has maintenance action been previously requested?
8. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument to the factory prepaid. If requested, an estimate of charges will be made before work begins.

(1) Contact Metrics Division, Bridgeport, Connecticut for *Commander**, *Empire**, *Panoramic**, and *Sensitive Research** instruments. Contact Metrics Division, Los Angeles, California for *Gertsch** instruments.

(2) Include data on symptoms, measurements taken, suspected location of trouble, maintenance action taken, and any other relevant data.

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SECTION I

INTRODUCTION

1-1. GENERAL.

THIS INSTRUCTION MANUAL CONTAINS INFORMATION CONCERNING THE ELECTRICAL AND PHYSICAL CHARACTERISTICS, INSTALLATION AND OPERATION OF THE PANORAMIC POWER SPECTRAL DENSITY ANALYZER, MODEL PDA-1, AS WELL AS INFORMATION CONCERNING THE MAINTENANCE AND SERVICING OF THE MODEL PDA-1.

NO ATTEMPT TO OPERATE THE EQUIPMENT SHOULD BE MADE UNTIL THE USER IS THOROUGHLY FAMILIAR WITH THE INFORMATION CONTAINED IN SECTION III, OPERATING INSTRUCTIONS.

1-2. APPLICATIONS.

THE PANORAMIC POWER SPECTRAL DENSITY ANALYZER, MODEL PDA-1, IS A COMPANION INSTRUMENT TO THE PANORAMIC SONIC SPECTRUM ANALYZER, MODEL LP-1A, PANORAMIC SUBSONIC SPECTRUM ANALYZERS, MODELS LF-1 AND LF-2B, AND SEVERAL OTHER PANORAMIC SPECTRUM ANALYZERS IN HIGHER FREQUENCY BANDS.

THE PANORAMIC POWER SPECTRAL DENSITY ANALYZER, MODEL PDA-1, ANALYZES, AND DISPLAYS ON ITS ASSOCIATED RECORDER, THE RELATIVE TOTALIZED VOLTAGE OR POWER VS. FREQUENCY CHARACTERISTICS OF A SELECTED SPECTRUM SEGMENT. THE VOLTAGE OR POWER DENSITY IS DISPLAYED ON THE VERTICAL (PEN DEFLECTION) AXIS; FREQUENCY IS DISPLAYED ON THE HORIZONTAL (CHART TRAVEL) AXIS.

INPUT DATA TO THE MODEL PDA-1 CAN EITHER BE LIVE OR DERIVED FROM MAGNETIC TAPE RECORDINGS IN THE FORM OF CONTINUOUS LOOPS.

CENTER FREQUENCY AND SWEEP WIDTHS ARE DETERMINED BY THE APPROPRIATE CONTROLS ON THE COMPANION PANORAMIC SPECTRUM ANALYZERS.

THE FREQUENCY SCAN PERIODS OF 0.5-16 MINUTES OR 0.5-16 HOURS (DETERMINED BY THE COMPANION ANALYZER AND RECORDER) PERMIT THE FULL FREQUENCY RESOLUTION CAPABILITIES OF THE COMPANION ANALYZER TO BE REALIZED.

INSTANTANEOUS AND AVERAGE READOUTS ARE PROVIDED IN ADDITION TO THE INTEGRATED READOUTS.

SYNCHRONOUS INTEGRATION PERIODS, DETERMINED BY LOOP LENGTH, OR "FREE RUNNING" CONTINUOUSLY VARIABLE (0.7 SECONDS TO 30 SECONDS) INTEGRATION PERIODS ARE PROVIDED.

1-3. EQUIPMENT SUPPLIED, MODEL PDA-1.

DESCRIPTION	QUANTITY
SPECTRAL POWER DENSITY ANALYZER, MODEL PDA-1	1
CABINET, VENTILATED DUSTCOVER	1
CONSTANT VOLTAGE TRANSFORMER, SOLA NO. 20-13-125	1
INTERCONNECTING CABLES	4

1-4. GENERAL DESCRIPTION.

THE MODEL PDA-1, PANORAMIC POWER SPECTRAL DENSITY ANALYZER, IS AN ACCESSORY TO PANORAMIC SPECTRUM ANALYZERS IN THE FREQUENCY RANGES FROM SUBSONIC THROUGH MICROWAVES. THE PDA-1 PROVIDES AUTOMATIC FACILITIES FOR A PEN-AND-INK CHART READOUT IN RELATIVE MEAN POWER OR VOLTAGE VS. FREQUENCY. IT CONSISTS OF SQUARING AND INTEGRATING NETWORKS WHICH ARE SCHEMATICALLY AT THE DETECTOR OUTPUT IN THE COMPANION ANALYZER. FOR VOLTAGE DENSITY MEASUREMENTS, THE SQUARING CIRCUITS ARE CONVERTED TO LINEAR AMPLIFIERS. THE ANALYZER SCANNING RATE IS ADJUSTED FOR 100% INTERCEPT OF THE DATA CONTAINED IN A TAPE LOOP DURING THE TIME FOR THE EXCURSION THROUGH A GIVEN IF BANDWIDTH. THE PDA-1 INTEGRATOR SUMS ALL THE SQUARED OR LINEAR INSTANTANEOUS EXCITATIONS AND RECORDS THE TOTAL AS AN APEX ORDINATE. READOUT IS ACCOMPLISHED ON THE PANORAMIC CHART RECORDER. AT THE END OF THE SELECTED INTEGRATION PERIOD, THE INTEGRATOR DISCHARGES RAPIDLY AND BEGINS THE PROGRESSIVE BUILDUP IN THE ADJACENT SMALL BANDWIDTH. THUS, THE LOCUS OF THESE APEXES DESCRIBES THE AVERAGE VOLTAGE OR POWER DENSITY THROUGHOUT THE TOTAL BAND SURVEYED BY THE ANALYZER. DEFLECTIONS ARE DIRECTLY PROPORTIONAL TO VOLTAGE OR POWER SPECTRAL DENSITY.

INPUT DATA IS CONVENIENTLY COUPLED TO THE PDA-1 ANALYZER SYSTEM FROM LOOPED TAPE RECORDINGS OF THE SIGNAL TO BE ANALYZED. THE SPLICE ON THE CONTINUOUS LOOP (OR OTHER CONVENIENT DEVICE) MAY BE USED TO DERIVE A SYNCHRONIZATION PULSE WHICH TRIGGERS THE PDA-1 INTEGRATOR DISCHARGING NETWORK. THIS ARRANGEMENT ASSURES THAT EACH INTEGRATION WILL INCLUDE ALL PORTIONS OF THE TAPE, AND IN ADDITION PRECLUDES POSSIBLE DIFFICULTIES DUE TO SPLICE TRANSIENTS CAUSING SPURIOUS SIGNAL INDICATIONS. THE INTEGRATION PERIOD MAY ALSO BE ESTABLISHED BY THE INTERNAL TIME BASE GENERATOR OF THE PDA-1.

FOR A PARTICULAR IF BANDWIDTH, THE ANALYSIS TIME MAY BE ESTIMATED BY THE FOLLOWING EXPRESSION:

$$\text{TOTAL SCAN TIME} = \frac{\text{SWEEP WIDTH}}{\text{IF BANDWIDTH}} \times \text{DATA DURATION TIME}$$

BOTH SWEEP WIDTH AND IF BANDWIDTH ARE CHOSEN BY FRONT PANEL CONTROLS OF THE COMPANION SPECTRUM ANALYZER.

1-5. ELECTRICAL CHARACTERISTICS, MODEL PDA-1.

FREQUENCY RANGE	SAME AS THE COMPANION SPECTRUM ANALYZER.
AMPLITUDE RANGE	SAME AS THE DYNAMIC RANGE OF THE SPECTRUM ANALYZER.
SCALE CALIBRATIONS: (SQUARE)	VOLTS SQUARED (G^2) PER CPS VS. FREQUENCY.
(LIN)	VOLTS/CPS VS. FREQUENCY
AMPLITUDE ACCURACY	(A) PDA-1; WITHIN 3% (B) PDA-1 AND COMPANION CHART RECORDER; WITHIN 5% (C) PDA-1 AND COMPANION ANALYZER; 5% ±2 (% ACCURACY OF ANALYZER)
RESOLUTION (ADJACENT CHANNEL SEPARABILITY)	BETTER THAN TWO (2) TIMES IF BANDWIDTH OF COMPANION PANORAMIC SPECTRUM ANALYZER
INTEGRATION PERIOD	CONTINUOUSLY VARIABLE FROM 0.7 SECONDS TO 30 SECONDS, EITHER SYNCHRONOUS OR FREE RUNNING.
MAGNETIC TAPE LOOP RE-PLAY PERIOD	0.7 SECONDS MINIMUM.
SCAN TIME	0.5, 1, 2, 4, 8 - 16 MINUTES OR 0.5, 1, 2, 4, 8 - 16 HOURS.
SCAN WIDTH	LINEAR SCAN; SAME AS IN COMPANION PANORAMIC SPECTRUM ANALYZER.
IF FILTER CHARACTERISTIC	CONSTANT CPS BANDWIDTH AND SHAPE AS IN COMPANION SPECTRUM ANALYZER.
POWER REQUIREMENTS	90 - 125 VOLTS; 50 - 60 CPS.*

*SUPPLIED WITH LINE REGULATOR FOR 60 CPS OPERATION. 50 CPS REGULATOR AVAILABLE ON SPECIAL ORDER.

1-6. PHYSICAL CHARACTERISTICS.

A. WEIGHTS.

DESCRIPTION	WEIGHT
MODEL PDA-1	37 LBS
CABINET	9 LBS
CONSTANT VOLTAGE TRANSFORMER SOLA NO. 20-13-125	30 LBS
INTERCONNECTING CABLES	1 LB

B. DIMENSIONS.

DESCRIPTION	DIMENSIONS
MODEL PDA-1 FRONT PANEL	19" W x 5-1/4" H x 1/8" T
PROJECTION OF HANDLES FROM PDA-1 FRONT PANEL	1-3/8"
DEPTH OF MODEL PDA-1 CHASSIS	18-1/2" **
CABINET	19" W x 5-1/4" H x 18-1/2"
CONSTANT VOLTAGE TRANSFORMER SOLA NO. 20-13-125	11-1/8" x 6-7/16" H x 6-15/16" W (MOUNTING CENTERS 4-9/16" x 6-1/8")
INTERCONNECTING CABLE, COAXIAL, W101 WITH 2 PLUGS: MILLEN TYPE 37212 AND BNC TYPE UG260/U	5'
INTERCONNECTING CABLE, COAXIAL, W102 WITH 2 PLUGS: MILLEN TYPE 37212 AND BNC TYPE UG260/U	5'
INTERCONNECTING CABLE, COAXIAL, W103 WITH 1 PLUG: BNC TYPE UG260/U	5'
INTERCONNECTING CABLE, COAXIAL, W104 WITH 2 PLUGS: BNC TYPE UG260/U	5'

**INCLUDES A 1/2" FUSE POST PROJECTION.

1-7. TUBE AND PLUG-IN UNIT COMPLEMENT.

Circuit Ref. Symbol		Type		Function
Tube	Plug-in	Tube	Plug-in	
V101-1	Z101	12AX7	USA-3	Input Operational Amplifier
V101-2	Z101	12AX7	USA-3	
V101-3	Z101	6U8	USA-3	
V101-4	Z101	6S4	USA-3	
G101	Z101	A-172	USA-3	
V102-1	Z102	12AX7	USA-3	Squaring Operational Amplifier
V102-2	Z102	12AX7	USA-3	
V102-3	Z102	6U8	USA-3	
V102-4	Z102	6S4	USA-3	
G102	Z102	A-172	USA-3	
V103-1	Z103	12AX7	USA-3	Integrator Operational Amplifier
V103-2	Z103	12AX7	USA-3	
V103-3	Z103	6U8	USA-3	
V103-4	Z103	6S4	USA-3	
G103	Z103	A-172	USA-3	
V104-1	Z104	12AX7	K2-W	Period Operational Amplifier
V104-2	Z104	12AX7	K2-W	
	Z105A			Squaring Network (negative)
	Z105B			Squaring Network (positive)
V105		12AT7		Sync Amplifier
V301		5U4GA/B		Rectifier
V302		6146		Series Regulator
V303		12AX7		Shunt Regulator Amplifier
V304		12AX7		Shunt Regulator
V305		5651/or OG3-85A2		Voltage Reference
V401		5Y3		Rectifier
V402		6BX7		Series Regulator
V403		12AX7		Shunt Regulator
V404		12AX7		Shunt Regulator
V405		5651/or OG3-85A2		Voltage Reference

1-8. FRONT PANEL CONTROLS.

A. The following operating controls are at the disposal of the operator. They are on the front panel of the Model PDA-1.

1. POWER - OFF.

THE MAIN POWER SWITCH IS A TOGGLE SWITCH. IT CONTROLS ALL POWER TO THE MODEL PDA-1. IT DOES NOT CONTROL THE CONSTANT-VOLTAGE TRANSFORMER.

2. INTEGRATION PERIOD.

THIS CONTROL IS USED TO SET THE DURATION OF THE INTEGRATION PERIOD.

3. METER SELECTOR.

THIS TWO-POSITION TOGGLE SWITCH IS USED TO MONITOR THE OUTPUTS OF THE INPUT AND OUTPUT OPERATIONAL AMPLIFIERS. A FULL-SCALE READING IN THE OUTPUT POSITION CORRESPONDS APPROXIMATELY TO A FULL-SCALE RECORDER PEN DEFLECTION.

4. READOUT SELECTOR.

THIS THREE-POSITION SWITCH PROVIDES A CHOICE OF INTEGRATED, AVERAGED, OR PEAK (INSTANTANEOUS) OUTPUTS.

5. TIME CONSTANT.

THIS FIVE-POSITION SWITCH SELECTS THE TIME CONSTANT IN THE INTEGRATING OR AVERAGING MODES OF OPERATION. THE AVAILABLE TIME CONSTANTS ARE 1, 5, 10, 50 AND 100 SECONDS.

6. SYNC.

THIS IS A TOGGLE SWITCH WHICH ALLOWS THE INTEGRATION PERIOD TO BE CONTROLLED INTERNALLY BY THE INTEGRATION PERIOD CONTROL, OR FROM AN EXTERNAL SOURCE.

7. LIN-SQUARE.

THIS IS A TOGGLE SWITCH WHICH SELECTS EITHER LINEAR OR SQUARING OPERATION. IN THE LIN POSITION THE RECORDER PLOTS VOLTAGE DENSITY; IN THE SQUARE POSITION THE RECORDER PLOTS POWER DENSITY.

B. IN ADDITION TO THE FRONT PANEL OPERATING CONTROLS, THERE ARE SEVERAL ADJUSTMENTS WHICH MUST BE MADE PERIODICALLY, BUT ARE NOT ORDINARILY USED IN THE OPERATION OF THE EQUIPMENT. THESE CONTROLS ARE SCREWDRIVER ADJUST CONTROLS AND ARE EQUIPPED WITH SHIFT LOCKS. THEIR FUNCTIONS ARE AS FOLLOWS:

1. PERIOD CAL.

THE PUSH-BUTTON SWITCH IS PRESSED AND THE PERIOD CAL CONTROL IS USED TO CENTER THE METER. THIS ADJUSTS THE INTEGRATION PERIOD TIMING CIRCUIT SO THAT THE INTEGRATION PERIOD CONTROL COVERS THE REQUIRED RANGE.

2. RECORDER ZERO.

THIS CONTROL ADJUSTS THE RECORDER PEN TO ZERO IN THE ABSENCE OF A SIGNAL.

1-9. SEMI-ADJUST CONTROLS.

THE FOLLOWING CONTROLS ARE NORMALLY ADJUSTED ONLY IN THE COURSE OF SERVICE AND MAINTENANCE; FOR THIS REASON THEY ARE LOCATED ON THE VARIOUS CHASSIS.

1. +300 V ADJ.

THIS CONTROL, WHICH IS LOCATED ON THE POWER SUPPLY CHASSIS, IS USED TO SET THE B+ POWER SUPPLY TO +300 VOLTS. A TEST POINT IS LOCATED ON THE CONNECTOR BRACKET IN THE REAR OF THE PDA-1.

2. -300 V ADJ.

THIS CONTROL, WHICH IS LOCATED ON THE -300 VOLT POWER SUPPLY, IS USED TO SET THE B- POWER SUPPLY TO -300 VOLTS. A TEST POINT IS LOCATED ON THE CONNECTOR BRACKET IN THE REAR OF THE PDA-1.

3. OFFSET COMP(ENSATOR). (SERIAL NOS. 105 AND HIGHER)

THIS CONTROL, WHICH IS LOCATED BETWEEN THE FRONT PANEL AND THE MAIN CHASSIS, IS USED TO COMPENSATE FOR ANY NEGATIVE DC OFFSET VOLTAGE IN THE INPUT SIGNAL. WITH NO INPUT TO THE COMPANION ANALYZER, SET THE PDA-1 READOUT SELECTOR TO INTEG, TIME CONSTANT TO 1 SEC, AND INTEGRATION PERIOD FULL CLOCKWISE. ADJUST THE OFFSET COMP CONTROL UNTIL THE RECORDER PEN DOES NOT DEFLECT DURING THE INTEGRATION PERIOD. THIS ADJUSTMENT MAY BE REACHED THROUGH THE ACCESS HOLE IN THE TOP OF THE PDA-1 CABINET.

NOTE

THIS ADJUSTMENT IS NOT REQUIRED WHEN THE PDA-1 IS USED WITH A PANORAMIC MODEL LF-1 WHOSE SERIAL NUMBER BEARS THE SUFFIX A, WITH A MODEL LF-2B, OR A MODEL LP-1A WHOSE SERIAL NUMBER BEARS THE SUFFIX S OR LATER. IN THIS CASE, SET THE OFFSET COMP ADJUSTMENT FULLY COUNTERCLOCKWISE. THIS ACTUATES A SWITCH WHICH REMOVES THE COMPENSATOR FROM THE CIRCUIT.

SECTION II

INSTALLATION

2-1. INITIAL INSPECTION.

THIS INSTRUMENT HAS BEEN TESTED AND CALIBRATED BEFORE SHIPMENT. ONLY MINOR PREPARATIONS ARE REQUIRED TO PUT THE INSTRUMENT IN OPERATION.

IF DAMAGE TO THE CASE IS EVIDENT WHEN DELIVERY IS MADE, HAVE THE PERSON MAKING THE DELIVERY DESCRIBE THE DAMAGE AND SIGN THE NOTATION ON ALL COPIES OF THE DELIVERY RECEIPT.

MOST PUBLIC CARRIERS DO NOT RECOGNIZE CLAIMS FOR CONCEALED DAMAGE IF SUCH DAMAGE IS NOT REPORTED WITHIN FIFTEEN DAYS AFTER DELIVERY. ALL SHIPPING CONTAINERS SHOULD BE OPENED AND THE EQUIPMENT INSPECTED BEFORE FIFTEEN DAYS ELAPSE.

IF DAMAGE IS FOUND, WHETHER CONCEALED OR OBVIOUS WHEN DELIVERED, CALL OR WRITE THE CARRIER AND ASK THAT AN INSPECTION BE MADE BY THEIR AGENT.

ALTHOUGH THE CARRIER IS LIABLE FOR ANY DAMAGE IN THE SHIPMENT, THE SINGER COMPANY, METRICS DIVISION, WILL ASSIST IN DESCRIBING AND PROVIDING FOR REPAIR OR REPLACEMENT OF DAMAGED ITEMS.

THE EQUIPMENT IS SHIPPED WITH ALL TUBES INSTALLED. CHECK THAT ALL TUBES ARE PROPERLY IN THEIR SOCKETS.

2-2. MOUNTING.

THE MODEL PDA-1 IS SUPPLIED IN A CABINET WITH A PERFORATED COVER TO PROVIDE VENTILATION. CARE SHOULD BE TAKEN THAT VENTILATION HOLES ARE NOT BLOCKED.

THE EQUIPMENT PROPER IS DESIGNED FOR MOUNTING IN A STANDARD RELAY RACK. SLOTS ON THE SIDES OF THE FRONT PANEL ARE PROVIDED FOR FASTENING THE EQUIPMENT TO THE FRONT OF THE RACK.

2-3. INTERCONNECTING PROCEDURE.

CABLE DESCRIPTION	CONNECTIONS	
	FROM	TO
LINE CORD	SOLA	SUITABLE SOURCE OF AC POWER
POWER CORD, WITH TWIST LOCK CONNECTOR	SOLA	TWIST LOCK CONNECTOR ON PDA-1 REAR CHASSIS

Cable Description	Connections	
	From	To
W101, Coaxial Cable with 1 Millen Plug & 1 BNC plug	OUTPUT connector on PDA-1 front panel	J3 BNC connector on RC-3B recorder
W104*, Coaxial Cable with 2 BNC plugs	OUTPUT connector on PDA-1 rear chassis	J3 BNC connector on RC-3B recorder

2-4. INSTALLATION ADJUSTMENTS AND CHECKS.

A. INSTALLATION ADJUSTMENTS.

1. Set the Model RC-3B switch to SPECTRUM ANALYZER. Turn PDA-1 Switch on and allow a 30 minute warm-up period.

NOTE

Before turning PDA-1 power off, set Recorder switch to SPECTRUM ANALYZER.

2. Apply signals to the companion Spectrum Analyzer and check for normal operation of the associated Panoramic equipment. See the appropriate Instruction Manual for installation adjustments and checks of the companion Analyzer. The operator should become thoroughly familiar with operation of the companion Analyzer before attempting to operate the PDA-1.

3. Remove signal from the INPUT of the companion Analyzer. Set the INPUT ATTENUATORS at MAXIMUM. Disconnect the external sync signal source.

4. Set the PDA-1 front panel controls as follows:

INTEGRATION PERIOD	MID-POINT OF ROTATIONAL RANGE
READOUT SELECTOR	INTEG
TIME CONSTANT	1 SEC
SYNC	INT

5. Press the PERIOD CAL button and adjust the adjacent front panel semi-adjust control for a constant meter reading. When the PERIOD CAL adjustment is not zeroed, the meter will drift slowly in either direction. Correct adjustment is

*W104 may be used instead of W101 if desired.

OBTAINED WHEN THE METER DOES NOT DRIFT FROM ZERO OVER A PERIOD OF AT LEAST 15 SEC. (WHILE THE PERIOD CAL BUTTON IS DEPRESSED). WHEN THE BUTTON IS RELEASED, THE NEON INDICATOR ON THE PDA-1 FRONT PANEL SHOULD BE FLASHING REGULARLY.

6. SET THE RECORDER SWITCH TO SPECTRAL DENSITY ANALYZER. START THE RECORDER. ADJUST FRONT PANEL SEMI-ADJUST CONTROL RECORDER ZERO UNTIL THE RECORDER PEN RECORDS ON THE BASE (LEFT EDGE) OF THE CHART CALIBRATION. TAP THE RECORDER CASE GENTLY TO OVERCOME PEN FRICTION WHILE MAKING THIS ADJUSTMENT.

7. SET THE RECORDER SWITCH TO SPECTRUM ANALYZER.

B. INSTALLATION CHECKS.

1. SET THE RECORDER SWITCH TO SPECTRAL DENSITY ANALYZER.

A. ADJUST THE INPUT ATTENUATORS OF THE COMPANION ANALYZER TO GIVE A MAXIMUM FULL-SCALE DEFLECTION OF THE RECORDER PEN EACH TIME THE PDA-1 NEON INDICATOR FLASHES, WHEN THE ANALYZER IS SWEEPING THROUGH A FULL-SCALE SIGNAL. THE PDA-1 TIME CONSTANT SWITCH MAY BE USED TO CONTROL THE AMPLITUDE OF THE PEN DEFLECTION.

B. START THE RECORDER AT AN 8 MIN (ARBITRARY) SCAN TIME. THE RECORDER PEN SHOULD MAKE AN INK TRACE IN RESPONSE TO THE INPUT SIGNALS.

SECTION III

OPERATING INSTRUCTIONS

3-1. GENERAL.

THE PANORAMIC POWER SPECTRAL DENSITY ANALYZER, MODEL PDA-1, PROVIDES AUTOMATIC FACILITIES FOR AN INK-ON-PAPER CHART PRESENTATION OF THE RELATIVE MEAN VOLTAGE OR POWER VS. FREQUENCY CHARACTERISTICS OF A RANDOM WAVEFORM.

THE INTEGRATED ANALYSIS APPEARS AS A SERIES OF APEX Y AXIS DEFLECTIONS OF THE RECORDING PEN. THE X AXIS, DURING ANY INTERVAL OF THE RECORDING PERIOD, INDICATES THE SMALL BAND OF SIGNAL FREQUENCIES WHICH IS BEING ANALYZED BY THE MODEL PDA-1. FREQUENCY SETTINGS OF CENTER FREQUENCY AND SWEEP WIDTH ARE SELECTED BY THE CONTROLS ON THE COMPANION ANALYZER. THE READOUT CHART HAS SPACE FOR INSERTING THE ANALYZER DIAL READINGS TO ESTABLISH THE FREQUENCY SCALE.

NORMALLY, THE SCANNING RATE IS ADJUSTED FOR 100% INTERCEPT OF THE DATA SAMPLE (LOOP PERIOD) DURING THE TIME FOR EXCURSION THROUGH ONE IF BANDWIDTH OF THE COMPANION ANALYZER. THE PDA-1 INTEGRATOR SUMS ALL THE LINEAR OR SQUARED INSTANTANEOUS EXCITATIONS DURING THE LOOP PERIOD. THE Y DEFLECTION OF THE PEN IS PROPORTIONAL TO THE INTEGRATOR OUTPUT LEVEL. BUILDUP CONTINUES UNTIL THE RAPID DISCHARGE WHICH IS USUALLY SYNCHRONIZED WITH THE TAPE LOOP SPLICE. EACH APEX ORDINATE THUS INDICATES THE TOTAL OF THE LINEAR OR SQUARED INPUT VOLTAGES EQUIVALENT TO MEAN SQUARE VOLTAGE DURING THE INTEGRATION PERIOD AT THE SMALL SPECTRUM BAND DEFINED BY THE ANALYZER SELECTIVITY SETTINGS.

THE PDA-1 AUTOMATICALLY AND REPEATEDLY SCANS THROUGH THE SELECTED SPECTRUM SEGMENT. THE 12" x 4-1/2" READOUT CHART IS SYNCHRONIZED WITH THE SCANNING MECHANISM SO AS TO FACILITATE INTERPRETATION OF X AND Y CALIBRATIONS.

3-2. PRELIMINARY ADJUSTMENTS OF COMPANION ANALYZER.

SET THE RECORDER SWITCH TO SPECTRUM ANALYZER. CHECK THE COMPANION ANALYZER FOR PROPER FUNCTIONING OF ALL FRONT PANEL CONTROLS. ADJUST THE COMPANION ANALYZER IN ACCORDANCE WITH THE SECTION ON PRELIMINARY ADJUSTMENTS OF THE APPROPRIATE INSTRUCTION MANUAL.

3-3. PRELIMINARY ADJUSTMENTS, MODEL PDA-1.

ADJUST THE MODEL PDA-1 IN ACCORDANCE WITH THE SECTION ON INSTALLATION ADJUSTMENTS AND CHECKS, SECTION 2-4.

3-4. OPERATING ADJUSTMENTS.

A. ALLOW AT LEAST A HALF HOUR WARM-UP PERIOD FOR BOTH THE MODEL PDA-1 AND THE ASSOCIATED ANALYZER.

B. CONNECT THE SOURCE OF SIGNALS TO BE EXAMINED TO THE INPUT CONNECTOR OF THE COMPANION ANALYZER.

C. PEAK READOUT MODE OF OPERATION.

1. SET THE FRONT PANEL CONTROLS OF THE COMPANION ANALYZER AS FOLLOWS:

CENTER FREQUENCY	- CENTER OF SPECTRUM SEGMENT OF INTEREST
SWEEP RANGE (SWEEP MODE)	- LIN RANGE COVERING WIDTH OF SPECTRUM SEGMENT OF INTEREST
AMPLITUDE SCALE	- LIN
INPUT ATTENUATORS	- TO GIVE FULL-SCALE PEN DEFLECTION FOR LARGEST SIGNAL PRESENT.

2. DISCONNECT SOURCE OF SYNC SIGNALS.

3. SET THE MODEL PDA-1 FRONT PANEL CONTROLS AS FOLLOWS:

READOUT SELECTOR	- PEAK

4. SET THE RECORDER SWITCH TO SPECTRAL DENSITY ANALYZER.

5. SET THE RECORDER SCAN TIME CONTROLS FOR A CONVENIENT SCAN RATE. START THE RECORDER.

6. ADJUST THE INPUT ATTENUATORS OF THE COMPANION ANALYZER UNTIL THE STRONGEST SIGNAL PRESENT CAUSES A FULL-SCALE DEFLECTION OF THE RECORDER PEN.

7. EQUIPMENT IS NOW CONDITIONED FOR ANALYSIS OF DATA SAMPLE.

8. IN THIS MODE OF OPERATION THE RECORDER DEFLECTION IS PROPORTIONAL TO THE SQUARE OF THE INSTANTANEOUS EXCITATION, OR DIRECTLY PROPORTIONAL TO THE INSTANTANEOUS EXCITATION IF THE PDA-1 IS SET FOR LIN.

D. AVE READOUT MODE OF OPERATION.

1. SET THE FRONT PANEL CONTROLS OF THE COMPANION ANALYZER AS LISTED IN PAR. 3-4.C.1.

2. SET THE PDA FRONT PANEL CONTROLS AS FOLLOWS:

READOUT SELECTOR	- AVE
TIME CONSTANT	- AS DESIRED

3. SET THE RECORDER SCAN TIME CONTROLS FOR A CONVENIENT SCAN TIME. START THE RECORDER.

4. ADJUST THE INPUT ATTENUATORS OF THE COMPANION ANALYZER UNTIL THE STRONGEST SIGNAL PRESENT CAUSES A FULL SCALE DEFLECTION OF THE RECORDER PEN.

5. EQUIPMENT IS NOW CONDITIONED FOR ANALYSIS OF DATA SAMPLE.

6. IN THIS MODE OF OPERATION, RECORDER PEN DEFLECTIONS ARE APPROXIMATELY PROPORTIONAL TO THE AVERAGE OF THE LINEAR OR SQUARED INSTANTANEOUS EXCITATIONS. THE TIME CONSTANT OF THE AVERAGING NETWORK MAY BE SET TO 1, 5, 10, 50, OR 100 SECONDS BY THE TIME CONSTANT SWITCH.

E. INTEG READOUT MODE OF OPERATION - EXTERNAL SYNC.

1. SET THE FRONT PANEL CONTROLS OF THE COMPANION ANALYZER AS LISTED IN PAR. 3-4.c.1.

*2. CONNECT SOURCE OF SYNC SIGNALS.

3. SET THE PDA-1 FRONT PANEL CONTROLS AS FOLLOWS:

SYNC	- EXT
READOUT SELECTOR	- INTEG
TIME CONSTANT	- AS DESIRED, DEPENDING ON POWER SPECTRAL DENSITY OF THE DATA SAMPLE AND THE INTEGRATION PERIOD.

4. SET THE RECORDER SCAN TIME CONTROLS FOR A CONVENIENT SCAN PERIOD.

5. ADJUST THE INPUT ATTENUATORS OF THE COMPANION ANALYZER UNTIL THE STRONGEST SIGNAL PRESENT CAUSES A FULL-SCALE DEFLECTION OF THE RECORDER PEN.

6. EQUIPMENT IS NOW CONDITIONED FOR ANALYSIS OF DATA SAMPLE.

F. INTEG READOUT MODE OF OPERATION - INTERNAL SYNC.

1. SET THE FRONT PANEL CONTROLS OF THE COMPANION ANALYZER AS LISTED IN PAR. 3-4.c.1.

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*SYNC MAY BE OBTAINED BY MEANS OF A NEGATIVE GOING PULSE OF 0.5 VOLT OR GREATER AMPLITUDE AND AT LEAST 5 MILLISECONDS DURATION INTO AN IMPEDANCE OF 1 MEGOHM.

2. Set the PDA-1 front panel controls as follows:

SYNC	- INT
READOUT SELECTOR	- INTEG
INTEGRATION PERIOD	- Convenient readout period (0.7 sec., 30 sec.). May be timed by flashing of neon indicator on front panel.
TIME CONSTANT	- As desired, depending on power spectral density of data sample and the integration period.

3. Set the Recorder SCAN TIME controls for a convenient scan period.

4. Adjust the INPUT ATTENUATORS of the companion Analyzer until the strongest signal present causes a full-scale deflection of the recorder pen.

5. Equipment is now conditioned for analysis of data sample.

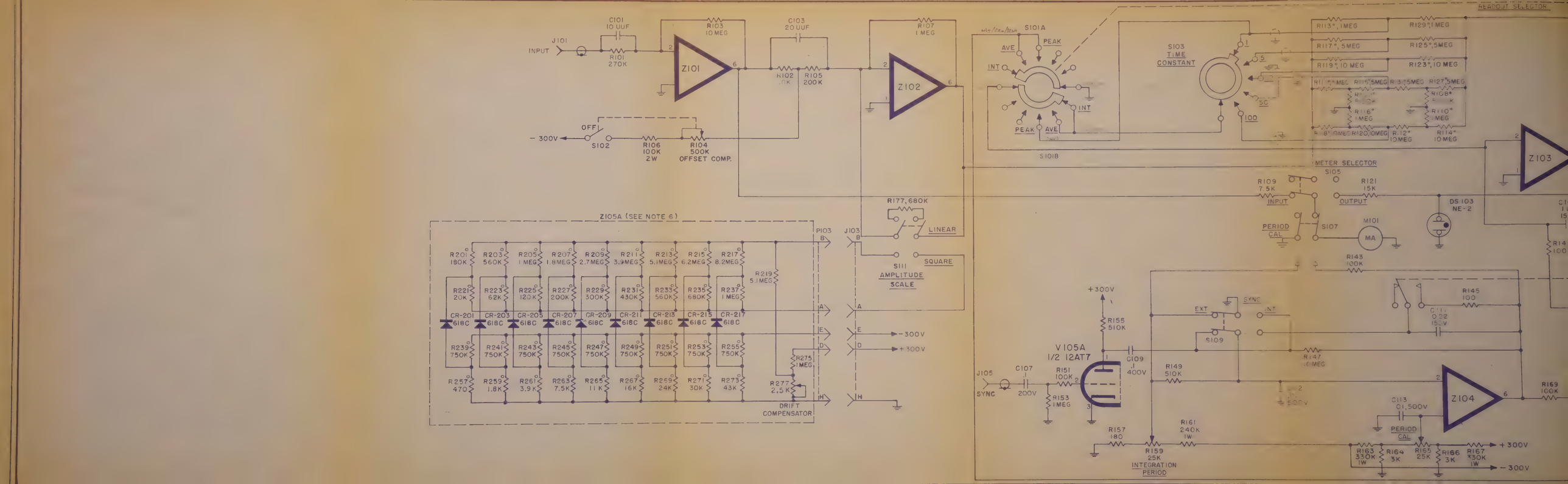
G. OPERATION WITH EQUIPMENT OTHER THAN SPECTRUM ANALYZERS.

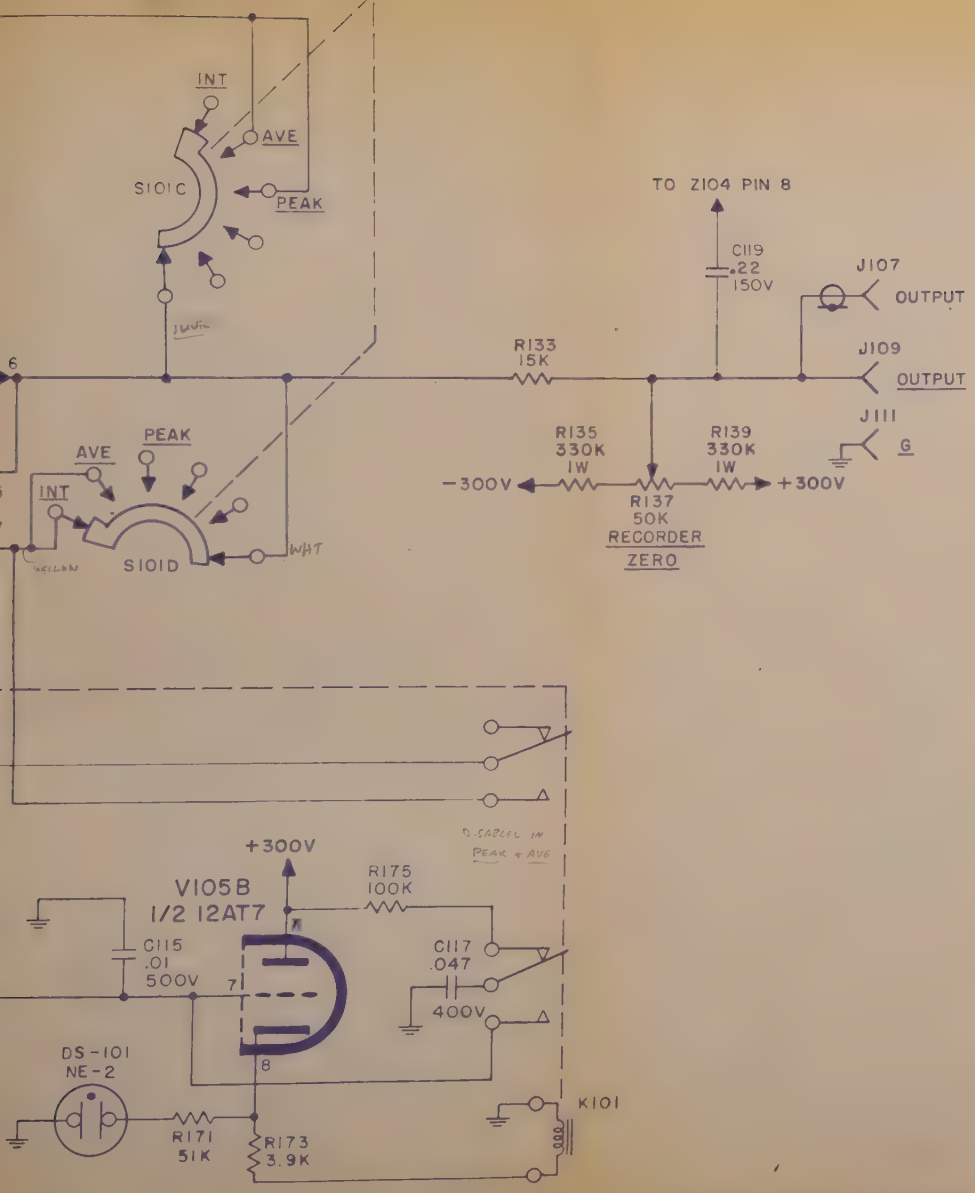
The PDA-1 is normally shipped with the plug-in squaring network Z105A installed. This is used with input signals of negative polarity such as are obtained from spectrum analyzers. In the event that other signal sources having positive polarity are used, it is necessary to replace Z105A with Z105B (available on special order). In this case the polarity of the output from the PDA-1 will be negative instead of the normal positive output, and it will be necessary to reverse the galvanometer leads to the J3 BNC connector on the RC-3B.

3-5. INTERPRETATION OF CHART RECORDINGS.

A. When the Model PDA-1 is employed with synchronized integration, the locus of the maximum vertical (Y axis) deflections is proportional to relative power spectral density in the frequency range covered by the X axis excursion.

The vertical deflection is proportional to the equivalent noise bandwidth of the companion Analyzer IF filter, the integration period, the overall gain of the equipment, and the arithmetic sum of the linear or squared net excitations during the integration period of all signals in band. Since all factors except the last are constant during a test run, the deflections may be interpreted as being proportional to the squared excitations (power) within the noise bandwidth, or to the voltage (Lin) within the noise bandwidth.


READOUT SELECTOR
J101
INPUT
C101
10 UUF
R101
270K
R103
10 MEG
Z101
C103
20 UUF
R102
.01K
R105
200K
R107
1 MEG
Z102
OFF
S102
- 300V
R106
100K
2W
R104
500K
OFFSET COMP.
S101A
AVE
PEAK
INT
S101B
S103
TIME
CONSTANT
1
.5
.5C
.1C
R113* 1MEG
R129* 1MEG
R117* .5MEG
R125* .5MEG
R119* 10 MEG
R123* 10 MEG
R111* 5MEG
R115* 5MEG
R131* 5MEG
R127* 5MEG
R112* 10MEG
R120* 10MEG
R132* 10MEG
R114* 10MEG
METER SELECTOR
S105
R109
7.5K
INPUT
R121
15K
OUTPUT
PERIOD
CAL
S107
M101
MA
DS 103
NE-2
R143
100K
Z103
R177, 680K
LINEAR
SQUARE
S111
AMPLITUDE
SCALE
J103
Z105A (SEE NOTE 6)
P103
R201 180K
R203 560K
R205 1 MEG
R207 1.8MEG
R209 2.7MEG
R211 3.3MEG
R213 5.1MEG
R215 6.2MEG
R217 8.2MEG
R219 5.1MEG
R221 20K
R223 62K
R225 120K
R227 200K
R229 300K
R231 430K
R233 560K
R235 680K
R237 1 MEG
CR-201 618C
CR-203 618C
CR-205 618C
CR-207 618C
CR-209 618C
CR-211 618C
CR-213 618C
CR-215 618C
CR-217 618C
R239 750K
R241 750K
R243 750K
R245 750K
R247 750K
R249 750K
R251 750K
R253 750K
R255 750K
R257 470
R259 1.8K
R261 3.9K
R263 7.5K
R265 11K
R267 16K
R269 24K
R271 30K
R273 43K
R275 1 MEG
R277 2.5K
DRIFT
COMPENSATOR
A
E
D
H
- 300V
+ 300V
+300V
R155 510K
V105A
1/2 12AT7
J105
SYNC
C107
200V
R153 1MEG
R151 100K
C109
400V
EXT
SYNC
INT
S109
R147 1 MEG
R149 510K
R145 100
C111
0.22
150V
R157 180
R159 25K
INTEGRATION
PERIOD
R161 240K 1W
C113
01, 500V
PERIOD
CAL
Z104
R163 330K 1W
R164 3K
R165 25K
R166 3K
R167 330K 1W
R169 100K
R14 100



NOTES

1. UNDERLINED TITLES ARE LOCATED ON THE FRONT PANEL.
2. ALL FIXED RESISTORS ARE 1/2 W UNLESS OTHERWISE SPECIFIED.
3. ALL VARIABLE RESISTORS ARE 2 W UNLESS OTHERWISE SPECIFIED.
4. ALL CAPACITORS ARE IN UF UNLESS OTHERWISE SPECIFIED.
5. * : ± 1% TOLERANCE.
6. Z105B IS IDENTICAL TO Z105A EXCEPT FOR INTERCHANGE OF +300V AND -300V CONNECTIONS AND REVERSAL OF ALL DIODE POLARITIES.

CIRCUIT SYMBOL NUMBER	GEORGE A. PHILBRICK RESEARCHES INC. MODEL NUMBER
Z101	USA-3
Z102	USA-3
Z103	USA-3
Z104	K2-W

FACTORY ADJUST COMPONENTS		
REFERENCE SYMBOL	NOMINAL VALUE	VALUE USED

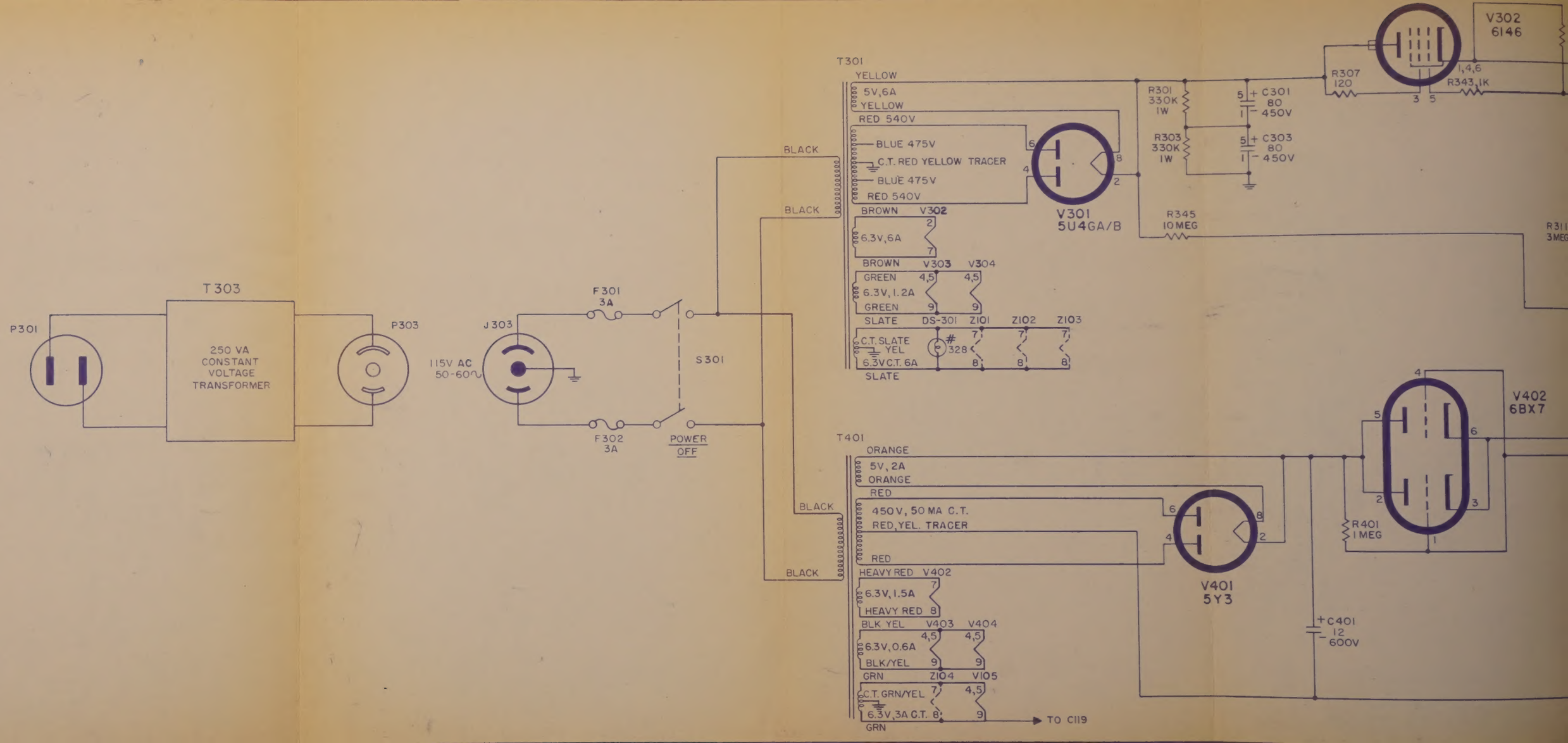
M	AS PER CO 5103			
L	AS PER CO-4958	J.S.	12-11-61	
K	AS PER CO 4264	F.B. 1-12-60		JDH 1-12-60
J	AS PER CO-4108, 4121, & 4197 WM	10-22-59		JDH 10-23-59
G	AS PER CO 3774	F.B. 10-3-58		JDH 10-3-58
F	AS PER CO-3727	I.P.	8-23-58	JDH 8-23-58
E	AS PER CO-3673	J.S.	8-7-58	JDH 8-8-58
D	REDRAWN AS PER CO 3656	J.S.	7-17-58	JDH 8-6-58

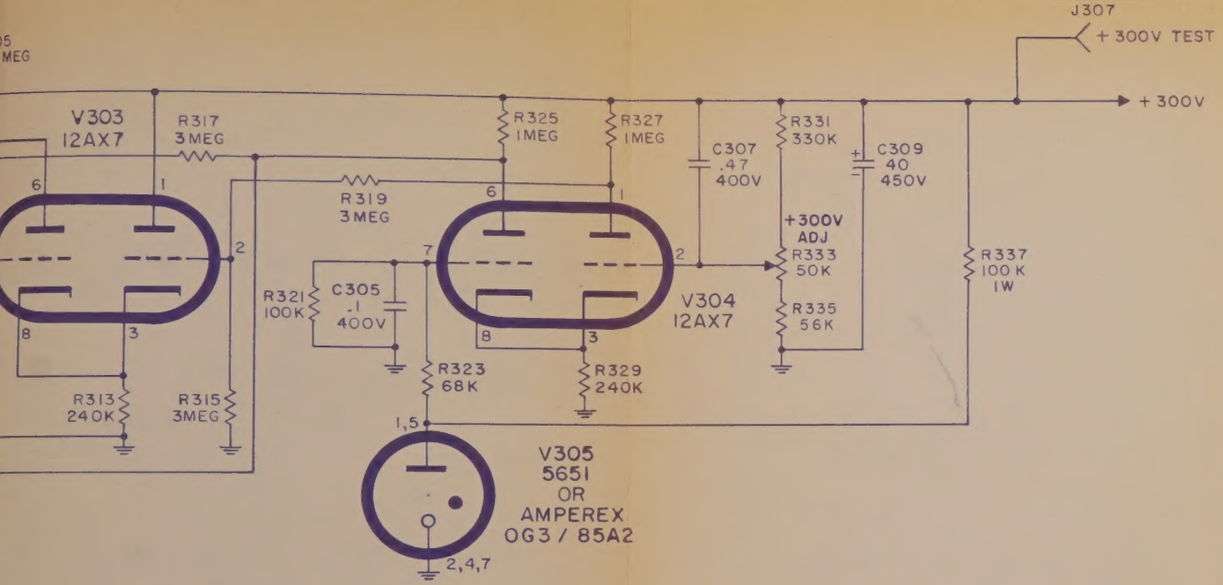
USED ON			
PDA-1	DRAFTSMAN	J.S.	7-8-59
	CHECKER	F.B.	7-16-59
	ORIGINATOR	JDH	
	APPROVED		

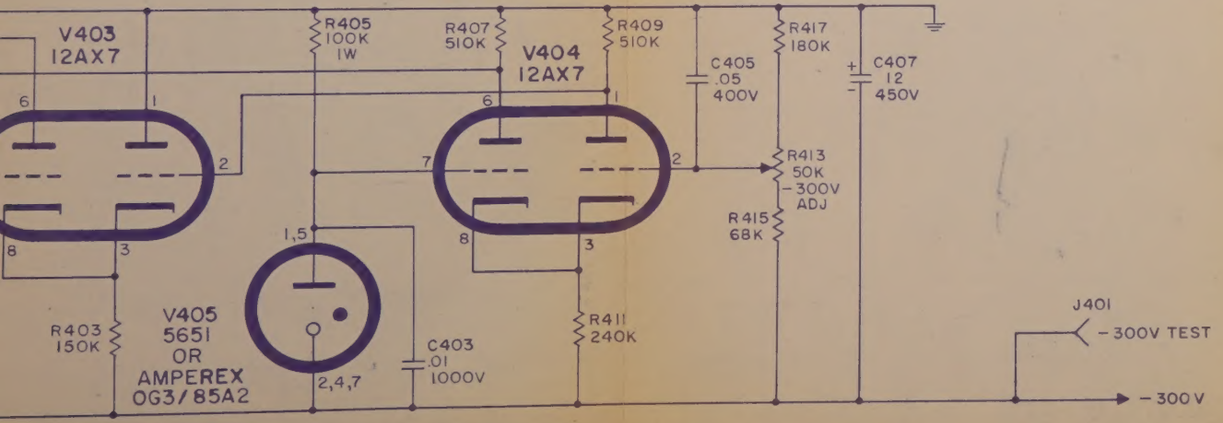
THE SINGER COMPANY, METRICS DIVISION
BRIDGEPORT, CONN., U.S.A.

PDA-1 ANALYZER

SCALE | DRAWING NUMBER | 556155-163 1/2


T303
P301
250 VA
CONSTANT
VOLTAGE
TRANSFORMER
P303
J303
115V AC
50-60~
F301
3A
F302
3A
S301
POWER
OFF
BLACK
BLACK
BLACK
BLACK
T301
YELLOW
5V,6A
YELLOW
RED 540V
BLUE 475V
C.T. RED YELLOW TRACER
BLUE 475V
RED 540V
V301
5U4GA/B
BROWN V302
6.3V,6A
BROWN V303 V304
GREEN 4,5 4,5
6.3V, 1.2A
GREEN 9 9
SLATE DS-301 Z101 Z102 Z103
C.T. SLATE YEL
#328
6.3V C.T. 6A
SLATE
R301
330K
1W
R303
330K
1W
C301
80
450V
C303
80
450V
R345
10 MEG
V302
6146
R307
120
R343 1K
1,4,6
3 5
T401
ORANGE
5V, 2A
ORANGE
RED
450V, 50 MA C.T.
RED, YEL. TRACER
RED
V401
5Y3
HEAVY RED V402
6.3V, 1.5A
HEAVY RED
BLK YEL V403 V404
6.3V, 0.6A
BLK/YEL
GRN Z104 V105
C.T. GRN/YEL
6.3V, 3A C.T.
GRN
TO C119
V402
6BX7
R401
1 MEG
+C401
12
600V





NOTES:

1. ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN UF UNLESS OTHERWISE SPECIFIED.
3. UNDERLINED TITLES APPEAR ON FRONT PANEL.

M	AS PER CO 5103 ADDED R164+R166	
L	AS PER CO 4958 H.S. 12-14-61	JDH 1-8-62
K	AS PER CO 4-264 F.B. 1-12-60	JDH 1-12-60
J	AS PER CO-4108, 4121, & 4197 WM 10-22-59	JDH 10-23-59
G	AS PER CO 3774 F.B. 10-3-58	JDH 10-3-58
F	AS PER CO #3727 J.P. 8-23-58	JDH 8-23-58
E	AS PER CO #3673 J.S. 8-22-58	JDH 8-22-58
D	AS PER CO #3656 J.P. 6-12-58	JDH 6-13-58
C	AS PER CO #3624 J.S. 4-11-58	I.D.
B	AS PER CO #3620 J.S. 4-11-58	M.Z.
A	AS PER CO #3588 F.B. 4-10-58	M.Z. 4-10-58

USED ON	DRAFTSMAN	J.S.	3-3-58
PDA-1	CHECKER	F.B.	3-25-58
	ORIGINATOR		3/25/58
APPROVED	MECH.	—	
	ELECT.	—	
	SPEC.	—	
	ENG.		3/25/58

THE SINGER COMPANY, METRICS DIVISION
BRIDGEPORT, CONN., U.S.A.

PDA-1 POWER SUPPLY SCHEMATIC

DRAWING NUMBER 556155-163½ REVISION M